



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: <b>PCT/US86/02058</b> (22) International Filing Date: <b>30 September 1986 (30.09.86)</b> (71) Applicant: <b>RISDON CORPORATION [US/US]; One Risdon Street, Naugatuck, CT 06770 (US).</b> (72) Inventor: <b>VAN BRÖCKLIN, Owen, F. ; 126 Illinois Avenue, Bristol, CT 06010 (US).</b> (74) Agent: <b>ST. ONGE, Ronald, J.; St. Onge Steward Johnston &amp; Reens, 986 Bedford Street, Stamford, CT 06905 (US).</b> (81) Designated States: <b>AT (European patent), BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), LU (European patent), NL (European patent), SE (European patent).</b></p>		<p><b>Published</b> <i>With international search report.</i></p>
<p>(54) Title: <b>AN ASSEMBLY AND METHOD FOR SECURING AND SEALING A DISPENSER TO A FLANGED CONTAINER</b></p> <div> </div> <p>(57) Abstract</p> <p>An assembly for securing and sealing a dispenser, such as a pump or valve, to a flanged container (10). The assembly comprises a mounting cup (24) having a generally cylindrical skirt (50) around its periphery and a sealing collar (26) including a sleeve (32) having a diameter sized to receive the sidewall (20) of the flange (16) and sized to be encased by the mounting cup (24). The end portion of the sleeve (32), preferably a plurality of spaced tabs (46), is in the path of movement of the mounting cup (24) and is deformed radially inwardly beneath the flange ledge (22) thereby to secure the collar (26) to the flange (16).</p>		

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AN ASSEMBLY AND METHOD FOR SECURING AND  
SEALING A DISPENSER TO A FLANGED CONTAINER

BACKGROUND OF THE INVENTION

(1) Field of the Invention

The present invention relates to a method and assembly for securing and sealing a dispenser, such as a pump, a valve or other dispensing means with respect to a flanged container. More particularly, the present invention relates to an assembly and method for securing a dispenser to a container without the necessity of complex mechanical operations.

(2) Brief Description of the Prior Art

It is desirable to secure a dispenser such as a pump, a valve, or other dispensing means to a container for storing a liquid product. A typical container may be made of glass and have a neck with an opening for dispensing the product. A flange is included around the opening and has an inwardly directed ledge.

An assembly in accordance with the invention can be used with a pump of the type disclosed in U.S. Patent 4,173,297 to Pettersen. The Pettersen patent discloses a pump that is mounted with respect to the container through use of a metal mounting ferrule, also termed a mounting cup. The bottom of the skirt of the mounting cup is deformed beneath the container flange to retain the pump and associated seal in place. Such crimping operation requires specialized

machinery made specifically for such crimping operation. Thus, filling of the bottle must be accomplished adjacent a relatively complex crimping device. Moreover, since each dispenser must be positioned, and then crimped, the process of crimping the mounting cups is relatively time consuming. In certain applications, it may be desirable to avoid an appearance wherein the end of the mounting cup is crimped, and this is particularly the case in certain cosmetic applications wherein the outward appearance of the package is important.

In designs where the mounting cup has been crimped, it may be desirable to provide an additional appearance sleeve which fits over the mounting cup and obscures the crimped portion of the mounting cup. The use of an additional sleeve adds to the cost of the components and assembly of the components.

It has been proposed to use a hard plastic collar having an annular recess which receives the flange, or bead as it is also termed. An annular retaining rib snap-locks under the flange or bead when installed. Such designs are disclosed in U.S. Patent No. 4,216,883, U.S. Patent No. 4,193,551 and U.S. Patent No. 4,073,398. The latter patent discloses a retainer collar that holds the annular retaining rib beneath the container flange. The snap-locking feature of such designs typically requires use of hard plastics which are not effective for providing a liquid seal.

Thus, it is an object of the present invention to provide an assembly and a method for securing and sealing a dispenser with respect to the flange of a container in a simplified fashion which requires relatively unsophisticated equipment for assembly. In accordance with one aspect of the invention it is desired to provide an assembly and a method for securing and sealing which does not require crimping of the metal mounting cup beneath the flange of the container. In accordance with another object of the invention, it would be desirable to avoid use of an appearance sleeve for obscuring the crimped portion of the mounting cup.

SUMMARY OF THE INVENTION

In accordance with one aspect of the invention, an assembly for securing and sealing a dispenser, such as a pump or a valve, to a flanged container is disclosed. The assembly comprises a mounting cup comprising a substantially rigid material, such as, for example, metal wherein the cup has a skirt around its periphery. The cup slidable through a path of movement over the container flange to an assembled position.

The assembly also includes a sealing collar comprising a deformable material, preferably a resilient deformable material. The collar has a ring including a flange that is in contact with the upper surface of the flange in the assembled position. The collar includes a sleeve depending from the ring wherein the sleeve has a diameter sized to receive the sidewall of the flange, but also is sized to be encased by the mounting cup skirt. The sleeve includes an end portion protruding in the path of movement of the skirt. When the sealing collar and mounting cup are assembled, the sleeve forces the protrusion inwardly to a position beneath the flange of the container thereby securing the collar to the flange.

In accordance with one aspect of the invention, at least a portion of the sleeve is tapered, and preferably frustoconical, in shape wherein the upper region of the frustoconical sleeve has a diameter less than the flange diameter. The lower region of the frustoconical sleeve has a diameter equal or greater than the flange diameter. When the frustoconical sleeve is forced over the flange, it deforms slightly and provides an annular area of contact, which seals the collar.

In accordance with one aspect of the invention, the container flange, the mounting cup and the sealing collar are all symmetric to a central axis. During assembly of the components, the axes of the mounting cup, the sealing collar

and the flange are placed in a coincident relation and are assembled by moving the three components together. More specifically, the container, and thus the flange is held in a stationary position. The sealing collar and the mounting cup are placed on the container flange, and the mounting cup is urged in an axial direction toward the flange. The mounting cup skirt as it slides with respect to the sealing collar sleeve forces and deforms the protruding end portion radially inwardly and into a position beneath the ledge of the flange. Thus, the flange is securely grasped at one end by the ring and at the other end by the deformed end portion of the sleeve of the sealing collar. Thus, a secure seal is provided.

In accordance with one aspect of the invention, the skirt of the mounting cup includes a radially outwardly directed step. The portion of the mounting cup skirt above the step has an inner diameter slightly less than the outer diameter of the sealing collar sleeve. The surface of the mounting cup skirt frictionally engages the outer surface of the sleeve of the sealing collar to retain the components in an assembled position with respect to each other. The skirt may also include a second radically stepped portion which contacts the ring and holds it in position when the components are assembled.

In accordance with one aspect of the invention the end portion of the sleeve includes a plurality of slots around its periphery. The slots define a plurality of deformable tabs which are deformed as the mounting cup moves through its path of movement.

The assembly with the present invention is particularly simple in design and requires only two components in addition to the container flange. The components are assembled by urging the mounting cup and the sealing collar toward the container flange in an axial direction. No sophisticated mechanical devices are necessary for assembling the components and the components are assembled by axial movement of the mounting cup. The advantage of the

simplified assembly is important. In many applications, the person filling the bottles may not have access to sophisticated machinery for crimping, and therefore, a device which permits ease in assembly is particularly desirable. In addition, the mounting cup does not require crimping. Thus, the appearance of the bottom of the mounting cup is attractive and an additional appearance sleeve is unnecessary. Additional advantages of an assembly and method in accordance with the invention will be apparent from the brief description of the drawings and a detailed description of the invention which follows.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view taken along the common axis of the components of the assembly, and shows the components prior to assembly;

FIG. 2 is a view similar to that shown in FIG. 1 with the exception that the components have been assembled;

FIG. 3 is a top view of the sealing collar shown in FIGS. 1-2;

FIG. 4 is the bottom view of the sealing collar shown in FIGS. 1-3;

FIG. 5 is a side view partially broken away of the sealing collar shown in FIGS. 1-4;

FIG. 6 is a partial sectional view of another embodiment of the invention prior to assembly; and

FIG. 7 is a view similar to that of FIG. 6 after assembly.

#### DETAILED DESCRIPTION OF THE INVENTION

Referring to Figures 1 and 2, a container 10 of the type having a neck 12 with an opening 14 for dispensing product stored in the container as shown. The neck includes a flange 16 which includes an upper surface 18 surrounding the

opening 14, a sidewall 20 about its periphery and an inwardly directed ledge 22 at the bottom of the flange. The container is typically made of glass, although other types of materials such as plastic or metal can be utilized. An assembly in accordance with the present invention is particularly suited for use with cosmetic containers such as those containing perfume.

An assembly in accordance with the present invention includes a mounting cup 24 and a sealing collar 26. The sealing collar 26 comprises a deformable material, and preferably a resilient deformable material such as polyethylene, including linear low density polyethylene, rubber elastomers, or vinyl. The sealing collar 26 includes a ring 28 having a floor 30 for contacting the upper surface 18 of the container flange. The collar includes a sleeve 32 extending from the ring 28. The sleeve has an inner diameter sized to receive the sidewall 20 of the flange, and preferably, the inner diameter of the 34 of the sleeve is slightly less than the diameter than the flange wall 20 to provide a snug, frictional fit. The sleeve 32 is preferably generally cylindrical and symmetric with respect to axis 36. The upper end of sleeve 32 includes an annular protrusion 38 which is shaped to be received by the interior surface of a step in the mounting cup 24, and such will be described hereinafter.

The sealing collar 26 can be designed to receive any number of different types of dispensers including pumps, valves, shaker plug type valve, squeeze type valves, and pouring type valves. The collar includes a central opening 40 for receiving the dispenser, such as a pump, and includes other structures which are designed specifically for the type of dispenser to be used with the assembly. Thus, the portion of the sealing collar above the ring is not described in detail inasmuch as it can be changed and adapted to various types of dispensers.

Referring in particular to Figures 3, 4 and 5, the end portion of sleeve 32 includes a radially outwardly protruding member 42 located in the path of movement of the



mounting cup 24. More specifically, the sleeve includes a plurality of slots 44 about its periphery. The slots 44 define a plurality of deformable tabs 46. It is preferred that the tabs 46 include an inclined camming surface 48 (See FIG. 5). When the sleeve moves downwardly it contacts camming surface 48 and forces each of the tabs radially inwardly. The camming surface preferably has an angle with respect to the vertical axis 36 of between 30 and 60 degrees, most preferably 45 degrees. It is preferable that the sealing collar be of a molded polymeric material which can be formed in a single piece. Alternatively, if necessary, the collar could be formed in a plurality of pieces so long as the tabs 46 are deformable.

As shown particularly well in Figure 5, the sleeve 32 also includes a frustoconical portion 33. The upper region 35 has a diameter less than the diameter of the flange while the lower region 37 has a diameter equal to or greater than the flange diameter. As shown in Figure 2, when assembled, the frustoconical portion deforms slightly and contacts the flange to provide an annular area 39 of contact.

Referring to Figures 1 and 2, the mounting cup 24 will now be described in detail. The mounting cup is preferably made of a material which is substantially rigid, such as metal, hard plastic, wood or glass. The cup 24 includes a skirt 50 which has a shape symmetric with respect to common axis 36. More specifically, the mounting cup has a generally cylindrical shape, but may also have a frustoconical shape symmetric with respect to central axis 36. The skirt 50 includes a first stepped portion 52 and a second stepped portion 54. Both steps 52 and 54 are directed radially outwardly from central axis 36 so that the entire cup can be placed over both the sealing collar and the container flange. The inner diameter 56 of the portion of the cup between steps 52 and 54 is approximately equal to the outer diameter of sleeve 32. If desired, the inner diameter 56 of the cup can be slightly less than the

outer diameter of sleeve 32 so that the sleeve is slightly compressed between the flange sidewall 20 and the interior surface of the mounting cup.

Both steps 52 and 54 are at an angle with respect to central axis 36 so as to match respectively the angles on annular protrusion 38 and camming surface 48. More specifically, as shown in Figure 2, in an assembled position, the step portion 52 contacts the upper surface 39 of annular protrusion 38 and forces the ring 28 into contact with the upper surface 18 of the flange. Also, as shown in a comparison between Figures 1 and 2, the step portion 54 contacts the camming surface 48 and forces the tab 46 radially inwardly beneath ledge 22. It should be understood that by a "ledge" it is meant an inward slot or groove which is capable of receiving tab 46. In certain instances, it may be desirable to include a flange having a continuous sidewall which extends to the shoulder 60 of the bottle. In such instance, the ledge would be simply an annular groove sized to receive the deformed tab 46. The method and apparatus for assembling the various components will be described with respect to Figure 2.

The apparatus for assembling the device includes an annular ring 62 that is movable downwardly in the direction of arrow 64 to the position shown in Figure 2. The annular ring is shown schematically and is connected to suitable mechanical devices for moving the ring downwardly. The container is maintained in a stationary position, and the components slide only along the axis 36 which is an axis common to the mounting cup, the sealing collar and the container flange. The sealing collar 26 may be placed on the flange in the position shown in Figure 1. Alternatively, if desired, the sealing collar could be placed at a position wherein there is a space between the ring 28 and the upper surface 18 of the flange. The mounting cup 24 is placed over the sealing collar 26 and forced axially downwardly with respect to the container. The ring 62 contacts the step 52 and urges the cup down-

wardly. The stepped portion 54 contacts the camming surface 48 and exerts a downward force on the entire sealing collar. In the instance where the ring 28 is spaced from the flange 16 in an initial condition, the force of the step 54 against the camming surface 48 urges the entire sealing collar axially downwardly. During movement of the sealing collar with respect to the flange, the tabs 46 are blocked from radially inward movement until they reach the position shown in Figure 2. The collar ring 28 when it contacts the upper surface of the flange limits further movement of the collar with respect to the flange. Thereafter, as the mounting cup 24 is forced axially downwardly by the annular ring 62, the step 54 urges the camming surface radially inwardly and thus deforms the tabs to the position shown in Figure 2.

The method of assembly has been described with the annular ring 62 moving with respect to a stationary container. It should be understood that it is the relative movement which produces the assembly of the various components, and it is also possible to move the container and the various components upwardly with respect to an annular ring.

Referring to Figures 6 and 7, another embodiment of the invention is shown. The container and sealing collar are identical to those shown in Figures 1-5. The mounting cup 68 includes an annular retaining ring 70 which protrudes radially inwardly beneath the deformed tabs 46 when in an assembled position. More specifically, the mounting cup 68 is made of a plastic material having a small degree of flexibility which permits it to slightly deform radially outwardly as it rides over sleeve 32. When tabs 46 are deformed, retaining ring 70 snaps into the position shown in Figure 7 beneath deformed tabs 46. The snap-lock provided by ring 70 assists in maintaining the various components in assembly.

As can be appreciated, the method of assembly is particularly simple and does not require complicated ma-

chinery. The only required step is the reciprocating of an annular ring which contacts one of the step portions of the mounting cup. If necessary, the components could be assembled by a hand press. As shown in the assembled version in Figure 2, the three components, the sealing collar, the mounting cup and the container flange are held in a substantially fixed position by the frictional forces between the parts. The flange is secured between the deformed tab 46 and the ring 28 to hold the assembly in a fixed position. Although it is desirable to use an assembly according to the present invention to avoid the necessity of a subsequent crimping operation, in some instances it may be desirable to crimp the terminal end 70 of the mounting cup around the deformed tabs. This would particularly be the case if a crimped appearance were to be desired.

In summary, the present invention provides an extremely simplistic method of assembling the various components, and provides for an assembly that does not require crimping. The frictional forces between the components maintain the components in a fixed assembled position. The assembly is useful not only for pumps but also may be adapted for various types of dispensers including pumps, valves, shaker plug type valves, squeeze type valves and pouring type valves.

It should be understood that although specific embodiments of the invention have been described herein in detail, such description is for purposes of illustration only and modifications may be made thereto by those skilled in the art within the scope of the invention.

## Claims:

1. An assembly for securing and sealing a dispenser with respect to a container of the type having a neck with an opening for dispensing product, the neck having a flange including an upper surface surrounding the opening, a side-wall about its periphery and an inwardly directed ledge at the bottom thereof, the assembly comprising:
- 5 a mounting cup comprising a substantially rigid material, said cup having a skirt around its periphery, said cup slidable through a path of movement over said container flange to an assembled position;
- 10 a sealing collar comprising a deformable material, said collar having a ring including a floor, said floor being in contact with said flange upper surface in said assembled position, said collar including a sleeve depending from said ring and having a diameter sized to receive said flange sidewall and sized to be encased by said mounting cup skirt,
- 15 said sleeve including means protruding in said path of movement of said mounting cup for securing and sealing said collar with respect to said container flange, said means deforming under said ledge as said mounting cup moves to said assembled position, said mounting cup skirt including means for forcing said ring toward said container flange and for maintaining said floor of said ring in contact with said flange upper surface in said assembled position to thereby
- 20 maintain said flange between said floor and said securing means.
2. An assembly for securing and sealing a dispenser with respect to a container of the type having a neck with an opening for dispensing product, the neck having a generally circular flange symmetric to an axis, said flange including
- 5 an upper surface surrounding the opening, a sidewall about periphery and an inwardly directed ledge at the bottom thereof, the assembly comprising:

10 a mounting cup comprising a substantially rigid material, said cup having a substantially continuous cylindrical skirt around its periphery, said skirt having a step protruding radially outwardly with respect to a central axis of said mounting cup, said cup being slidable through a path of movement wherein the central axis of the mounting cup is coincident with the axis of said container flange, said cup  
15 being movable to an assembled position;

a sealing collar comprising a deformable material, said collar having a central axis, said collar being movable through a path of movement wherein said collar axis is coincident with said cup axis and said flange axis, said  
20 collar having an annular ring including a floor, said floor being in contact with said upper surface in said assembled position, said collar including a generally cylindrically shaped sleeve depending from said ring, said sleeve having a diameter sized to receive said flange sidewall and sized to  
25 be encased by said mounting cup wall, said radial step of said mounting cup forcing said collar toward said flange as said cup slides through its path of movement, said sleeve including an end portion protruding radially in said path of movement of said mounting cup, said end portion being de-  
30 formed radially inwardly under said ledge to secure said sealing collar with respect to said flange.

3. An assembly according to claim 2 wherein at least a portion of said mounting cup above said step has an inner diameter substantially equal to the outer diameter of said sealing collar sleeve, said inner diameter of said mounting  
5 cup wall frictionally engaging the outer diameter of sealing collar to retain said mounting cup in an assembled position with respect to said container.

4. An assembly according to claim 2 wherein said skirt has an annular retaining ring projecting inwardly from said skirt, said retaining ring and skirt adjacent said retaining ring deforming outwardly as said retaining ring slides over

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5 said collar sleeve, said ring returning to its undeformed condition beneath said deformed end portion of said collar to maintain said collar and mounting cup in said assembled position.

5. An assembly according to claim 4 wherein said mounting cup comprises a hard plastic material and said collar comprises a soft plastic material.

6. An assembly according to claim 3 wherein said flange sidewall has an outer diameter substantially equal to the inner diameter of said sealing collar sleeve to provide a tight frictional fit between said sleeve and said flange  
5 sidewall in said assembled position.

7. An assembly according to claim 2 wherein said sleeve includes a frustoconical portion having an upper region having a diameter less than said flange diameter and having a lower portion having a diameter at least equal to  
5 said flange diameter, said frustoconical portion deforming and being in contact with said flange sidewall in an annular area.

8. An assembly according to claim 2 wherein said end portion of said sleeve includes a plurality of slots about its periphery, said slots defining a plurality of deformable tabs about the periphery of the end portion of said sleeve, said  
5 tabs being deformed as said mounting cups moves through its path of movement.

9. An assembly according to claim 2 wherein said end portion of said sleeve includes a camming surface in said path of movement of said mounting cup, said camming surface being forced radially inwardly by said sleeve to position said end  
5 portion beneath said edge.

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10. An assembly for securing and sealing a dispenser with respect to a container of the type having a neck with an opening for dispensing the product, the neck having a flange surrounding the opening and an inwardly directed ledge at the bottom thereof, the assembly comprising:

a mounting cup comprising a substantially rigid material, said cup having a skirt about at least a portion of its periphery, the cup slidable through a path of movement over the container flange to an assembled position;

10 a sealing collar comprising a deformable material, said sealing collar including a sleeve having a diameter sized to receive the flange and sized to be encased by said mounting cup skirt, said sleeve including means protruding into the path of movement of the mounting cup for securing said collar with respect to said container flange, said means being deformed by said mounting cup to a position under said ledge as the mounting cup moves to an assembled position; and

15 a means for limiting travel of said sleeve with respect to said container flange to provide for alignment of said securing means and said flange ledge.

11. An assembly according to claim 10 wherein said limiting means comprises a ring integral with the sealing collar, said ring including a flange contacting said flange in said assembled position, said sleeve depending from said ring.

12. An assembly according to claim 10 wherein said limiting means comprises a tapered portion of said sleeve having a diameter less than the diameter of said flange sidewall, said tapered portion contacting said flange sidewall and deforming to seat said collar on said flange.



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13. An assembly according to claim 12 wherein said tapered portion has a frustoconical shape.

14. An assembly according to claim 10 wherein said skirt has an annular retaining ring projecting inwardly from said skirt, said retaining ring and skirt adjacent said retaining ring deforming outwardly as said retaining ring  
5 slides over said collar sleeve, said ring returning to its undeformed condition beneath said deformed end portion of said collar to maintain said collar and mounting cup in said assembled position.

15. An assembly for securing and sealing a dispenser with respect to a container of the type having a neck with an opening for dispensing product, the neck having a flange including an upper surface surrounding the opening, a side-  
5 wall about periphery and an inwardly directed ledge at the bottom thereof, the assembly comprising:

a mounting cup comprising a substantially rigid material, said cup having a skirt around its periphery, said cup slidable through a path of movement over said container  
10 flange to an assembled position;

a sealing collar comprising a deformable material, said collar including a sleeve having a diameter sized to receive said flange sidewall and sized to be encased by said mounting cup skirt, said sleeve having a tapered portion,  
15 said tapered portion having a diameter less than the diameter of said flange sidewall, said tapered portion contacting said flange sidewall and deforming to seat said collar on said flange, and said assembly including means for maintaining said sleeve in said assembled position and against relative  
20 movement with respect to said flange.

16. An assembly according to claim 11 wherein said maintaining means comprises means protruding from said sleeve in said path of movement of said mounting cup for securing and sealing said collar with respect to said con-

-16-

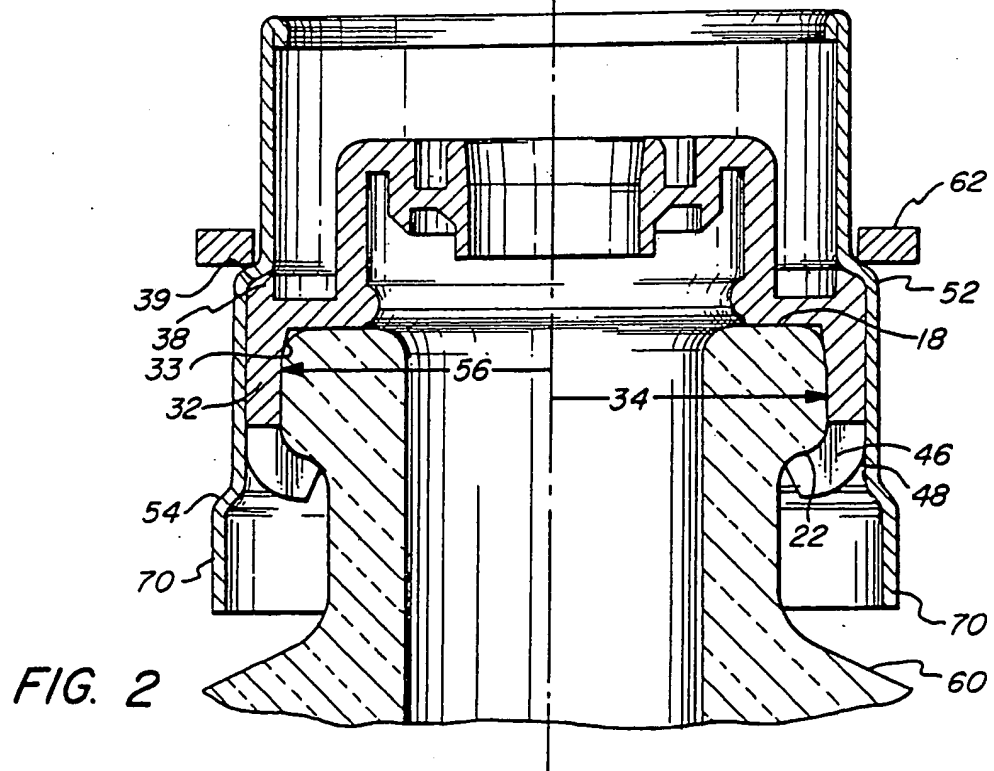
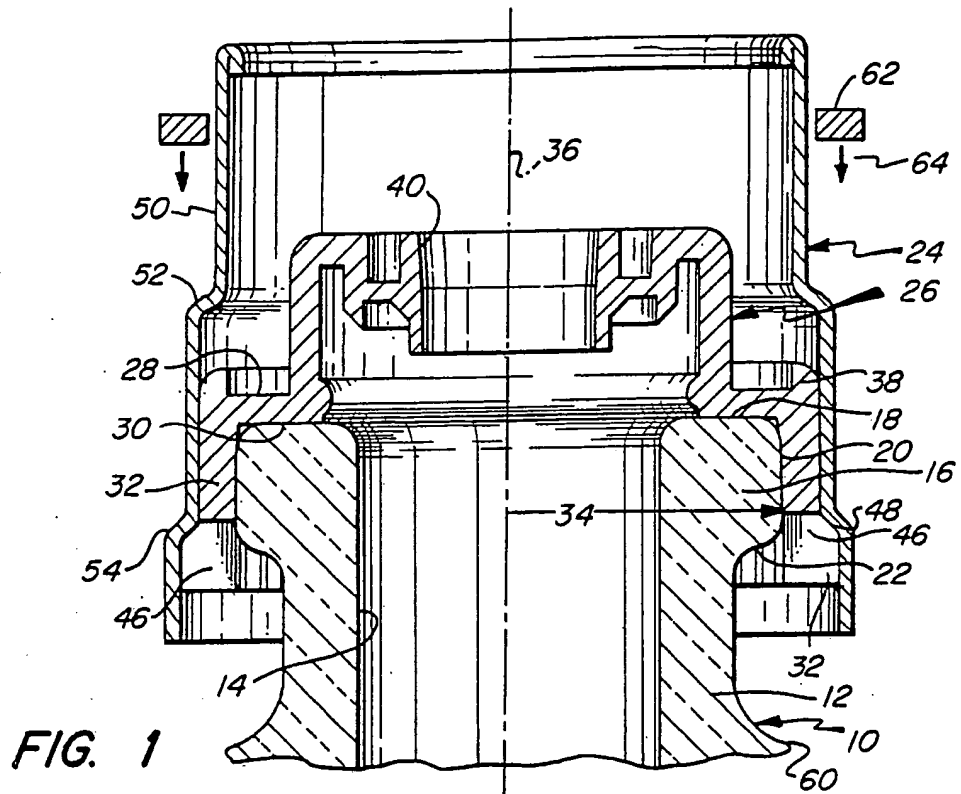
5 tainer flange, said means deforming under said ledge as said mounting cup moves to said assembled position.

17. A method for securing and sealing a dispenser with respect to a container of the type having a neck with an opening for dispensing product, the neck having a flange including a sidewall about its periphery and an inwardly directed ledge at the bottom thereof, the method comprising:

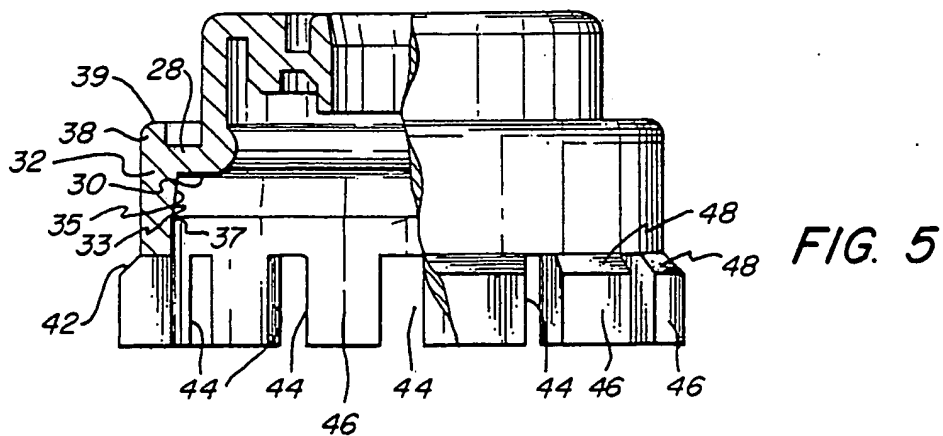
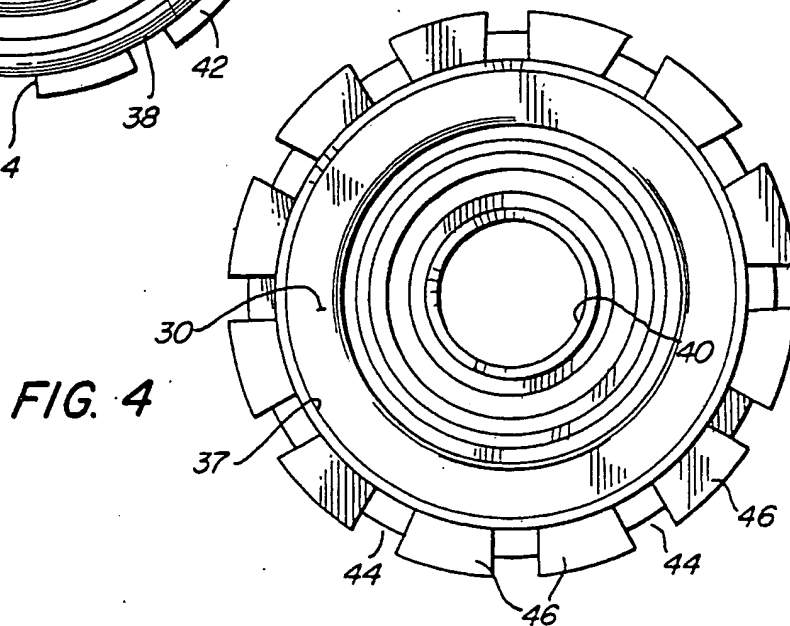
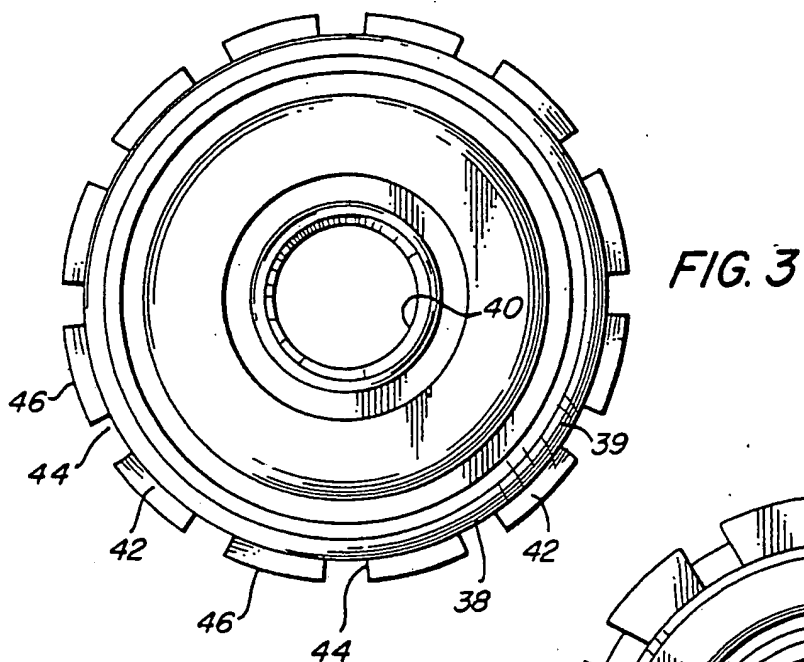
5 maintaining a mounting cup, a sealing collar, and said flange on a common axis, said mounting cup having a substantially cylindrical skirt symmetric with respect to said common axis, said sealing collar comprising a deformable material and including a sleeve having a diameter sized to receive said flange sidewall and sized to be encased by said mounting cup skirt, said sleeve including a portion protruding in the path of movement of the mounting cup;

10 assembling the flange, the mounting cup and the sealing collar by movement along said common axis, said mounting cup wall deforming said portion radially inwardly under said ledge to secure said collar to said flange.

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3/3

FIG. 6

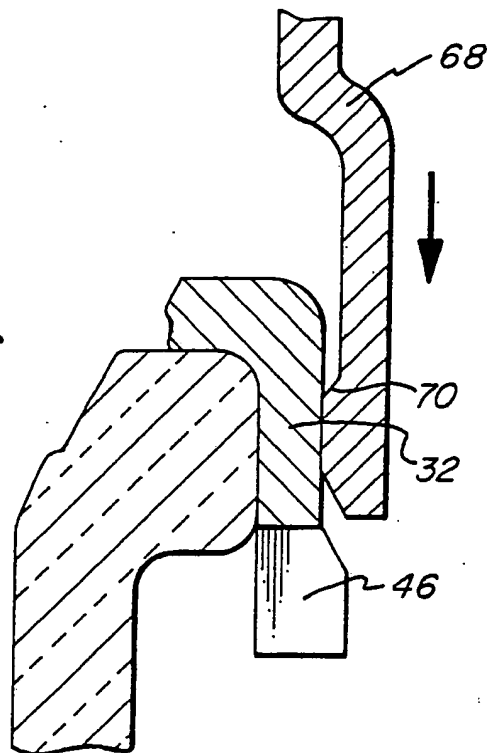
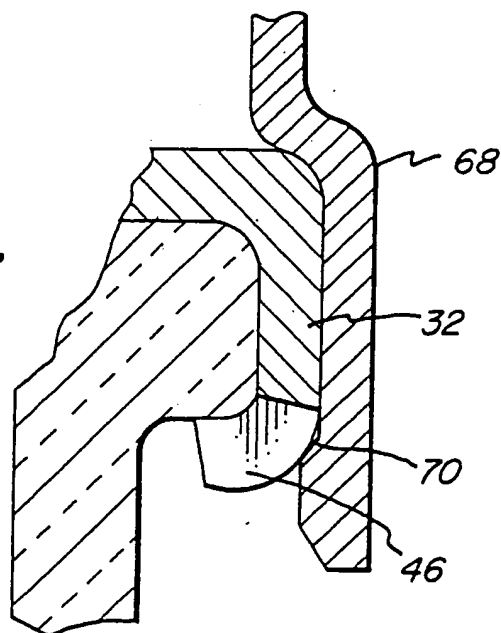
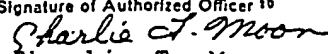
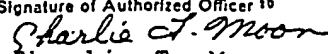
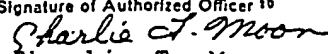


FIG. 7



# INTERNATIONAL SEARCH REPORT

International Application No PCT/US86/02058

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate them) <sup>3</sup> According to International Patent Classification (IPC) or to both National Classification and IPC Int. Cl. <sup>4</sup> B23P 11/02 B65D 45/32 B65D 88/54 U.S. Cl. 29-451 215-272 222-321																													
<b>II. FIELDS SEARCHED</b> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Minimum Documentation Searched<sup>6</sup></div> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 20%; border-bottom: 1px solid black;">Classification System</th> <th style="border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="vertical-align: top; padding: 5px;">U.S.</td> <td style="padding: 5px;">29-450, 451 215-272, 273, 274 222-321, 545, 562, 568, 570</td> </tr> </table> <div style="text-align: center; border-top: 1px solid black; border-bottom: 1px solid black;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched<sup>6</sup></div>			Classification System	Classification Symbols	U.S.	29-450, 451 215-272, 273, 274 222-321, 545, 562, 568, 570																							
Classification System	Classification Symbols																												
U.S.	29-450, 451 215-272, 273, 274 222-321, 545, 562, 568, 570																												
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>14</sup> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%; border-bottom: 1px solid black;">Category<sup>8</sup></th> <th style="border-bottom: 1px solid black;">Citation of Document,<sup>10</sup> with Indication, where appropriate, of the relevant passages<sup>17</sup></th> <th style="width: 20%; border-bottom: 1px solid black;">Relevant to Claim No.<sup>18</sup></th> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;"><u>X</u> <u>Y</u></td> <td style="padding: 5px;">US, A, 1,609,453 (Atwood) 07 December 1926 See entire document.</td> <td style="text-align: center; vertical-align: top; padding: 5px;"><u>1-3, 6-17</u> 4, 5</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;"><u>X</u> <u>Y</u></td> <td style="padding: 5px;">US, A, 4,073,398 (Schultz) 14 February 1978 See entire document.</td> <td style="text-align: center; vertical-align: top; padding: 5px;"><u>1, 10-17</u> 2-9</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;"><u>X</u> <u>Y</u></td> <td style="padding: 5px;">US, A, 2,723,773 (Greene) 15 November 1955 See Figures 1-14.</td> <td style="text-align: center; vertical-align: top; padding: 5px;"><u>1, 10-17</u> 2-9</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;"><u>X</u> <u>Y</u></td> <td style="padding: 5px;">FR, A, 2,534,557 (Perne et al) 20 April 1984 See Figures 1-3.</td> <td style="text-align: center; vertical-align: top; padding: 5px;"><u>1, 10-17</u> 2-9</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;"><u>X</u> <u>Y</u></td> <td style="padding: 5px;">DE, A, 2,708,530 (Rolf) 31 August 1978 See Figures 1-3.</td> <td style="text-align: center; vertical-align: top; padding: 5px;"><u>1, 10-17</u> 2-9</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">US, A, 4,251,003 (Bodenmann) 17 February 1981 (Figures 1-6).</td> <td></td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">US, A, 4,279,353 (Honma) 21 July 1981 (Figures 1, 2, 5 and 6)</td> <td></td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">US, A 4,359,166 (Dubach) 16 November 1982 (Figures 1-3).</td> <td></td> </tr> </table>			Category <sup>8</sup>	Citation of Document, <sup>10</sup> with Indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>	<u>X</u> <u>Y</u>	US, A, 1,609,453 (Atwood) 07 December 1926 See entire document.	<u>1-3, 6-17</u> 4, 5	<u>X</u> <u>Y</u>	US, A, 4,073,398 (Schultz) 14 February 1978 See entire document.	<u>1, 10-17</u> 2-9	<u>X</u> <u>Y</u>	US, A, 2,723,773 (Greene) 15 November 1955 See Figures 1-14.	<u>1, 10-17</u> 2-9	<u>X</u> <u>Y</u>	FR, A, 2,534,557 (Perne et al) 20 April 1984 See Figures 1-3.	<u>1, 10-17</u> 2-9	<u>X</u> <u>Y</u>	DE, A, 2,708,530 (Rolf) 31 August 1978 See Figures 1-3.	<u>1, 10-17</u> 2-9	A	US, A, 4,251,003 (Bodenmann) 17 February 1981 (Figures 1-6).		A	US, A, 4,279,353 (Honma) 21 July 1981 (Figures 1, 2, 5 and 6)		A	US, A 4,359,166 (Dubach) 16 November 1982 (Figures 1-3).	
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><sup>9</sup> Special categories of cited documents: <sup>15</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"d" document member of the same patent family</p> </div> </div>																													
<b>IV. CERTIFICATION</b> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-bottom: 1px solid black; padding: 5px;">Date of the Actual Completion of the International Search<sup>1</sup></td> <td style="width: 50%; border-bottom: 1px solid black; padding: 5px;">Date of Mailing of this International Search Report<sup>1</sup></td> </tr> <tr> <td style="padding: 5px;">04 December 1986</td> <td style="text-align: center; padding: 5px;">23 DEC 1986</td> </tr> <tr> <td style="border-bottom: 1px solid black; padding: 5px;">International Searching Authority<sup>1</sup></td> <td style="border-bottom: 1px solid black; padding: 5px;">Signature of Authorized Officer<sup>19</sup></td> </tr> <tr> <td style="padding: 5px;">ISA/U.S.</td> <td style="text-align: center; padding: 5px;">             Charlie T. Moon         </td> </tr> </table>			Date of the Actual Completion of the International Search <sup>1</sup>	Date of Mailing of this International Search Report <sup>1</sup>	04 December 1986	23 DEC 1986	International Searching Authority <sup>1</sup>	Signature of Authorized Officer <sup>19</sup>	ISA/U.S.	 Charlie T. Moon																			
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